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VENETIAN BLIND TILTING STRUCTURE

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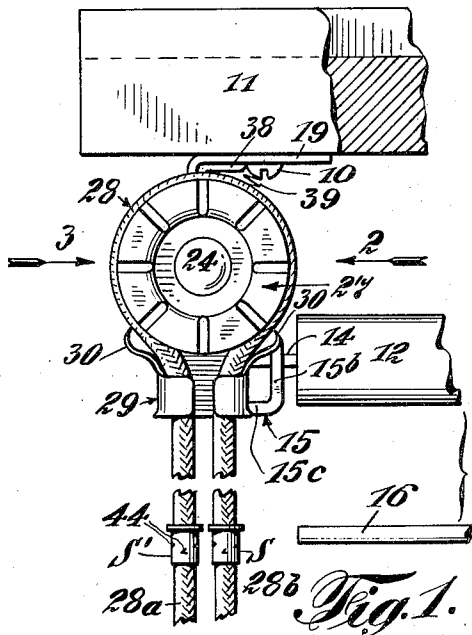


Fig. 1.

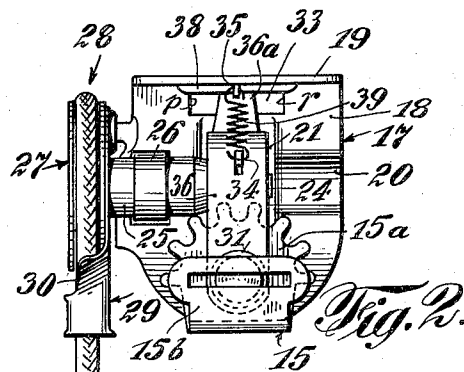


Fig. 2.

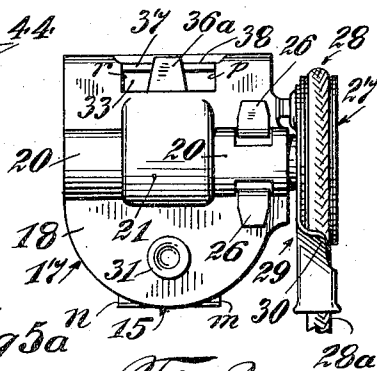


Fig. 3.

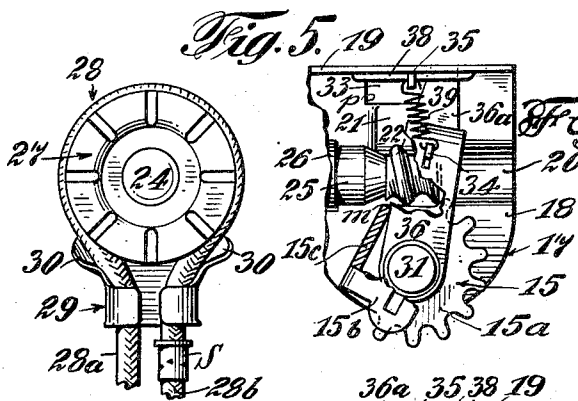


Fig. 5.

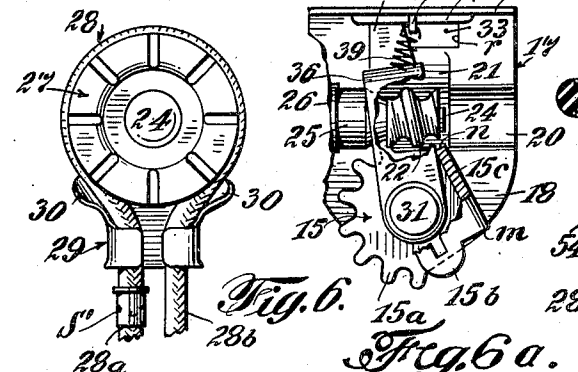


Fig. 6.

Fig. 6a.

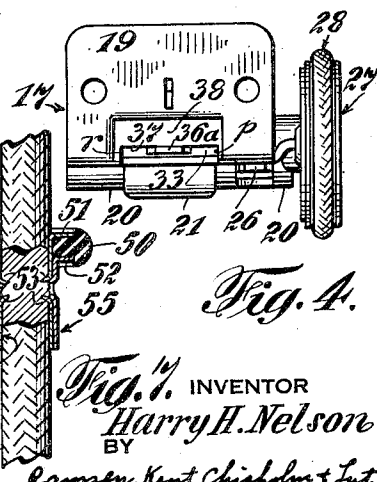


Fig. 4.

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## UNITED STATES PATENT OFFICE

2,174,994

## VENETIAN BLIND TILTING STRUCTURE

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9 Claims. (Cl. 156—17)

This invention relates to Venetian blinds, and various essential features of the invention are incorporated in a unit customarily referred to as a tilter. This tilter is, of course, used to tilt the tilt-bar or upper slat of a Venetian blind and thereby incline all of the slats, which are articulated with the tilt-bar in a conventional manner.

The present invention constitutes an improvement in worm-and-gear tilters, which are a type of tilter that is very old and extensively used. With such tilters the tilt-bar of the blind is actuated by a worm-driven gear or gear-sector, and the worm is rotated by a cord operated pulley. Usually the cord passes over the pulley and has its two ends hanging free in suitable position to be grasped by the operator. If the cord cumulatively slips or crawls in one direction over the pulley during repeated manipulations of the blind, one end of the cord eventually climbs inconveniently high while the other end droops too low. For some reason, which does not seem to be well understood, such cumulative slippage of the cord takes place in very many installations despite ribbed pulleys, cord guides, or other means that are usually used to minimize cord slippage. Accordingly, in actual practice it periodically becomes necessary with many installations to manually lift the cord from the pulley and relocate it thereon. Of course, this is considerable bother to a Venetian blind user, who ordinarily has to use a stepladder or the like to reach the pulley.

The principal object of the present invention is to provide quasi-automatic compensation for cumulative slippage of the operating cord of a worm-and-gear Venetian blind tilting structure.

Another object of the invention is to produce a worm-and-gear Venetian blind tilter which provides for relocation of a slipped operating cord without any manipulations other than mere pulling of the cord and which automatically arrests the adjusting movement of the cord in a suitable relocated position.

A still further object of the invention is to accomplish the foregoing results with a construction adapted for satisfactory and economical quality production, largely from inexpensive stamped metal sheet parts.

Various specific and detailed objects of the invention will be apparent from the accompanying disclosure.

The foregoing objects are accomplished by mounting the gear-sector for movement out of mesh with the worm and (preferably) providing stops on the operating cord to limit rotation of the worm when the gear-sector is out of mesh

therewith. Assuming that a single thread worm is used, the stops on the cord may be placed sufficiently far apart to permit approximately one complete rotation (or more) of the pulley in addition to the number of pulley rotations required for complete movement of the gear-sector in mesh with the worm. When slippage has accumulated equal to one complete pulley rotation, the gear-sector automatically moves out of mesh with the worm and then the worm gains a complete rotation (in the proper direction) with respect to the gear-sector, thereby compensating for the accumulated cord slippage. The word "cord" as used in this document designates a flexible pulley operating member of any suitable material or form.

In the form of the invention disclosed, the tilter includes means to limit movement of the gear-sector while it is out of mesh with the worm and to automatically restore the gear-sector into mesh with the worm upon completion of the compensating rotation of the worm. However, such means need not be incorporated in the tilter per se, as the tilt bar of the blind can be used to limit rotation of the gear-sector while it is out of mesh with the worm and the unbalanced weight of the tilted blind may be utilized to automatically restore the gear-sector into mesh with the worm.

Fig. 1 of the drawing is a front elevation showing a tilter of the present invention in conjunction with a Venetian blind. The showing of the blind is fragmentary, but includes a fragment of the head-bar or suspension bar of the blind, a fragment of the tilt-bar, and a fragment of the slat below the tilt-bar.

Fig. 2 is a side elevation of the tilter shown in Fig. 1, viewed from the direction of the arrow 2 in Fig. 1.

Fig. 3 is a side elevation of the tilter shown in Fig. 1, viewed from the direction of the arrow 3 in Fig. 1.

Fig. 4 is a top view of the tilter shown in Fig. 1.

Figs. 5 and 5a, taken together, form a composite illustrative view showing the position of the parts when the gear-sector has moved out of mesh with the worm in a clockwise direction. Fig. 5a shows the worm-and-gear and immediately associated parts in elevation (with parts cut away) when viewed from the same direction as in Fig. 2. However, Fig. 5 shows the pulley and operating cord when viewed from the same direction as in Fig. 1.

Figs. 6 and 6a are the same type of views as Figs. 5 and 5a respectively, but with the parts in the position they occupy when the gear-sector

has moved out of mesh with the worm in a counterclockwise direction.

Fig. 7 is a detail view showing a fragment of the operating cord, partially in elevation and partially in section, with a sectional showing of a modified form of stop attached to the cord.

The tilter per se is adapted to be attached by screws 10 (one shown) to a stationary head-bar 11. The tilt-bar 12 of the blind is coupled by a connector 14 to a gear-sector member 15 of the tilter. Suspended from the tilt-bar 12 are a series of conventional articulated slats, the first slat being shown fragmentarily at 16.

The various parts of the tilter are assembled on an inverted L-shaped stamped sheet metal bracket designated as a whole by 17 and having a vertical leg 18 and a horizontal leg 19. Pressed into the vertical leg 18 is a two-part transverse curved formation 20, 20 which constitutes a groove when viewed as in Fig. 2. Separating the two parts of the curved formation 20, 20 is an enlarged pressed formation 21 which constitutes a pocket when viewed as in Fig. 2. Located in the pocket 21 is a rugged coarse threaded worm 22 affixed to one end of a transverse operating shaft 24. This shaft is journaled in a tubular bearing member 25 secured in one of the groove portions 20 by a strap 26. Affixed to the outer end of the operating shaft 24 is a grooved operating pulley 27. Looped about the pulley is an operating cord 28 having depending branches 28a and 28b. On these branches are stops S' and S, respectively.

In conjunction with the pulley and cord there is a cord guide designated as a whole by 29. This cord guide is so constructed that the cord can be applied sidewise to the pulley in the manner described in the copending application of Hans K. Lorentzen, Serial Number 241,133, filed November 18, 1938. Such sidewise application of the cord to the pulley is facilitated by the flared out portions 30, 30 of the cord guide.

Stationarily affixed to the lower portion of vertical bracket leg 18 is a well-known type of headed pivot stud 31. This stud retains the gear-sector member designated as a whole by 15 and pivotally supports the same. This gear-sector member includes a sector proper 15a, a flat slotted portion 15b spaced sidewise from the sector 15a and arranged to receive the tilt slat connector 14 (Fig. 1), and a bridge member 15c uniting the parts 15a and 15b.

Caning forces imposed upon the gear-sector member 15 by the weight of the blind are arrested by a swinging arm 36 which lies against the exposed face of the gear-sector. The lower end of arm 36 is pivotally supported by the pivot stud 31 and the upper end is provided with a nose 36a which projects upwardly through a slot 33 formed at the juncture of the vertical bracket leg 18 and the horizontal leg 19. This slot is so formed as to produce a bearing edge 37 (Fig. 3) against which the nose 36a slides. This edge 37 is formed on a depressed portion 38 of the horizontal leg 19, thereby providing vertical clearance between the upper end of nose 36a and the top surface of horizontal bracket arm 19. Thus when the tilter is mounted, the nose 36a is operatively clear of the under surface of the head-bar 11. The swinging arm 36 is biased to the mid position, shown in Fig. 2, by coil spring 39. One end of spring 39 is attached to a hook 34 struck out from the arm 36 and the other end of the spring is attached to a hook 35 struck out from the metal of the horizontal bracket leg 19.

Assuming that the operating cord 28 is in

correct position on the pulley 27, pulling of the cord will rotate the pulley and move gear-sector member 15 in a conventional manner to tilt the slats of the blind. In such movement neither of the stops S' and S on the cord will engage the bottom of the cord guide 29. We will now assume that the cord accumulates slippage on the pulley in a clockwise direction corresponding to at least one complete rotation of the pulley 27. Downward pull on branch 28a of the cord will result in rotation of the worm until the gear-sector 15a has been moved out of mesh with the worm in a clockwise direction and can no longer be driven by the worm. Fig. 5a shows the position of the parts when the gear-sector 15a has moved out of mesh with the worm 22. In moving to this position, the edge m of bridge 15c engaged the swinging arm 36 and moved it in a clockwise direction against the pull of spring 39. Although the gear-sector 15a has been moved out of mesh with the worm, the nose 36a of the swinging arm cannot move beyond the end r (Fig. 4) of slot 33, which end of the slot constitutes a means to limit movement of the gear-sector while it is out of mesh with the worm. When the gear-sector 15a has gone out of mesh with the worm, further pull on branch 28a of the operating cord results in free rotation of the worm until stop S has engaged the cord guide 29. Thus, the worm gains one rotation relative to the gear-sector and thereby compensates for the accumulated slippage of the cord. When this compensating rotation of the worm has been completed, spring 39 acts through arm 36 and the edge m of bridge member 15c to restore the gear-sector into mesh with the worm. Thereafter movement of the cord tilts the blind in the conventional manner until further cord slippage has accumulated in an amount which results in another compensating rotation of the worm upon tilting of the blind slats.

If slippage of the cord accumulates in a counterclockwise direction on the pulley, compensation will take place upon pulling the branch 28b of the cord. The gear-sector 15a then moves out of mesh in a counterclockwise direction, as indicated in Fig. 6. Unlimited movement of the gear-sector while out of mesh with the worm is provided by the nose 36a striking the end p of the slot 33. Upon completion of the compensating rotation of the worm 22 further movement of the cord is prevented by stops S' engaging the cord guide 29. Then the spring 39 acts through arm 36 and the edge n of bridge 15c to restore the gear-sector to mesh with the worm.

As shown in Figs. 1, 2, 5 and 6, the stops S and S' are in the form of unset sheet metal eyelets, the shank of the eyelet closely embracing the cord and being affixed thereto in any suitable manner. As shown, the shanks of the eyelets are secured by prick indentations such as 44 which project tongues of metal into the cord. However, the shank of the eyelet may be shrunk onto the cord in other ways such as with a tool of the type used to attach fittings to the end of a rubber hose. In lieu of stops such as S and S', knots may be placed in the cord, but I prefer to use separate stops, as it is not always easy to place knots at exactly the desired distance apart.

Fig. 7 shows a modified form of stop which can be affixed to the cord. A rubber ring 50 is secured between the flanges 51 and 52 of two closely fitting telescoped eyelet shaped sheet metal members designated as a whole by 54 and 55, respectively. Fingers such as 53 may be punched inwardly from the metal of the shanks of the eyelet

shaped members to fixedly attach the stop to the cord. This form of stop is advantageous because if the stop strikes the ends of slats, such as slat 16, during the operation of the cord no objectionable noise is produced.

It will be apparent that by means of the present improvement a Venetian blind can be tilted in a conventional manner with a worm-driven gear-sector rotated by cord operated pulley. However, any accumulated slippage of the cord over the pulley will be periodically corrected in a quasi-automatic manner merely by operating the blind.

In compliance with the patent statutes I have disclosed the best form in which I have contemplated applying my invention. However, it will be apparent to those skilled in the art that the invention can be applied in various forms and accomplish substantially the same result in substantially the same manner.

What I claim is:

1. In a Venetian blind construction having a worm-driven gear-sector for tilting the slats of the blind, and a cord operated pulley for rotating the worm; the improvement which comprises: the gear-sector being mounted for movement out of mesh with the worm whereby the worm may be rotated an extra amount relative to the rotation of the gear-sector to compensate for accumulated slippage of the cord on the pulley, means to limit the movement of the gear-sector when it is out of mesh with the worm, means to limit the rotation of the worm when the gear-sector is out of mesh therewith, and means to restore the gear-sector to meshing relationship with the worm so that the worm drives the gear-sector to tilt the slats of the blind.

2. A Venetian blind construction as in claim 1 in which the means to limit rotation of the worm, comprises stops located on the pulley cord.

3. A Venetian blind construction as in claim 1 in which the gear-sector is included in a gear-sector member and the means to restore the gear-sector comprises a spring biased member engaged and displaced by the gear-sector member as the gear sector moves toward unmeshed position.

4. In a Venetian blind construction having a worm-driven gear-sector for tilting the slats of the blind, and a cord operated pulley for rotating the worm; the improvement which comprises: the gear-sector being mounted for movement out of mesh with the worm whereby the worm may be rotated an extra amount relative to the rotation of the gear-sector to compensate for accumulated slippage of the cord on the pulley, means to limit the rotation of the worm when the gear-sector is out of mesh therewith, and means to restore the gear-sector to meshing relationship with the worm so that the worm drives the gear-sector to tilt the slats of the blind.

5. In a Venetian blind construction having a worm-driven gear-sector for tilting the slats of

the blind, and a cord operated pulley for rotating the worm; the improvement which comprises: the gear-sector being mounted for movement out of mesh with the worm whereby the worm may be rotated an extra amount relative to the rotation of the gear-sector to compensate for accumulated slippage of the cord on the pulley, and means to limit rotation of the worm when the gear-sector is out of mesh therewith.

6. In a Venetian blind construction having a worm-driven gear-sector for tilting the slats of the blind, and a cord operated pulley for rotating the worm; the improvement which comprises: the gear-sector being mounted for rotation in either direction to a position out of mesh with the worm whereby the worm may be rotated an extra amount relative to the rotation of the gear-sector to compensate for accumulated slippage of the cord on the pulley, and means including stops on both branches of the cord to limit rotation of the worm when the gear-sector is out of mesh therewith.

7. In a Venetian blind tilter having a worm-driven gear-sector for tilting the slats of the blind, and a cord pulley for rotating the worm; the improvement which comprises: the gear-sector being mounted for rotation in either direction to a position out of mesh with the worm whereby the worm may be rotated an extra amount in either direction relative to the rotation of the gear-sector to compensate for accumulated slippage in either direction of a cord on the pulley.

8. In a Venetian blind tilter having a worm-driven gear-sector for tilting the slats of the blind, and a cord pulley for rotating the worm; the improvement which comprises: the gear-sector being mounted for rotation in either direction to a position out of mesh with the worm whereby the worm may be rotated an extra amount in either direction relative to the rotation of the gear-sector to compensate for accumulated slippage in either direction of a cord on the pulley, and means to limit the movement of the gear-sector when it is out of mesh with the worm.

9. In a Venetian blind tilter having a worm-driven gear-sector for tilting the slats of the blind, and a cord pulley for rotating the worm; the improvement which comprises: the gear-sector being mounted for rotation in either direction to a position out of mesh with the worm whereby the worm may be rotated an extra amount in either direction relative to the rotation of the gear-sector to compensate for accumulated slippage in either direction of a cord on the pulley, means to limit the movement of the gear-sector when it is out of mesh with the worm, and means to restore the gear-sector to meshing relationship with the worm so that the worm drives the gear-sector to tilt the slats of the blind.

HARRY H. NELSON.

### Disclaimer

2,174,994.—*Harry H. Nelson*, New York, N. Y. VENETIAN BLIND TILTING STRUCTURE. Patent dated Oct. 3, 1939. Disclaimer filed Nov. 17, 1950, by the assignee, *Lorentzen Hardware Mfg. Corp.*

Hereby enters this disclaimer as follows:

1. Referring to the sentence in the specification (page 1, column 2, lines 13-16), "The word 'cord' as used in this document designates a flexible pulley operating member of any suitable material or form.", hereby disclaims any construction of this sentence, if such be comprehended within its terms, to include within the word "cord" a chain the links or elements of which intermesh with formations on the pulley to prevent slippage of the chain on the pulley.

2. Also disclaims any construction of the claims of the patent, if such be in law comprehended by said claims in their present form, to cover a Venetian blind tilter or a Venetian blind tilting structure in which the word "cord" referred to in the claims is a chain the links or elements of which intermesh with formations on the pulley to prevent slippage of the chain on the pulley.

[*Official Gazette December 19, 1950*]